

Remarks/Arguments

Claim Summary

Claims 1, 3-4, 6-10, 13, 16-23, 25, 30-35 and 38-41 are now pending in the application.

That is, by this Amendment, claims 11-12, 26-28, 36-37 and 42-43 have been cancelled without prejudice or disclaimer of their subject matter.

Further, by this Amendment, claims 1, 8-10 and 13 have been revised.

In particular, with respect to independent claims 1 and 13, each of these claims has been revised to recite (a) plasma generation using an RF electrode and grounded substrate support, (b) formation of the film having a dielectric constant of 2.55 or less, and (c) the presence of Si-H bonds in the film.

Support for the use of an RF electrode and grounded substrate support can be found at least at page 8, lines 15-18, of the specification.

Support for the film having a dielectric constant of 2.55 or less can be found at least in original claim 12 of the application.

Support for the film having Si-H bonds can be found at least at page 16, lines 29-35, of the specification.

35 U.S.C. ¶102

Claims 1, 3-4, 6-8, 11, 13-17, 22-23, 25-28 and 30-43 were rejected under 35 U.S.C. ¶102 as being anticipated by Tsukune et al. (EP 0519079).

This rejection has been rendered moot¹ by the incorporation of dependent claim 12 (now cancelled) in each of independent claims 1 and 13.

¹ However, for the record, Applicants strongly disagree that the previously pending claims were anticipated by Tsukune et al. As has been repeatedly pointed out in Applicants' prior responses, Tsukune et al. teaches the inclusion of organic groups in the pre-set film. Specifically, Tsukune et al.

35 U.S.C. ¶103

Claims 9, 10, 12, 18-21 and 23 were rejected under 35 U.S.C. ¶103 as being obvious over Tsukune et al.

In the Office Action, the Examiner alleges:

“Tsukune et al. disclose all of the presently claimed limitations with the exception of the various reaction parameters such as the temperature, time and pressure ranges of the Claims at hand.

It would have been obvious ... to arrive at the presently claimed reaction parameters as the disclosure of Tsukune et al. broadly encompasses the presently claimed limitations.”

Clearly, the Examiner has overlooked previous pending claim 12 (now found in claims 1 and 13) which recited the dielectric constant of the film being 2.55 or less.

Tsukune et al. is directed to the formation of a silicon dioxide (SiO₂) film, which inherently has a dielectric constant substantially above 2.55. For example, the Examiner attention is directed to ATTACHMENTS A and B hereto, which show dielectric constants of SiO₂ being 4.5 and 3.9, respectively.

Further, Applicants can find no teaching or suggestion in Tsukune et al. that the SiO₂ film thereof would include Si-H bonds as recited in amended claims 1 and 13.

teaches that the inclusion of organic groups allows for the initial deposition of a flat film in its pre-set state. In other words, the polymer film is essentially fluid. Tsukune et al. also teaches that the fluid film undergoes some cross-linking resulting from heat absorbed from the wafer, and that organic groups remain after this reaction. Again, however, the film has not been set. Rather, setting of the film occurs as the result of a subsequent plasma and/or heat treatment in which the organic groups are removed to obtain the desired silicon oxide film. For *at least* these reasons and the reasons already of record, Applicants submit it to be manifest that the previously pending claims were not anticipated by Tsukune et al.

For at least² the reasons stated above, Applicants respectfully contend that claims 1, 3-4, 6-10, 13, 16-23, 25, 30-35 and 38-41 would not have been obvious to one skilled in the art in view of the teachings of Tsukune et al.

Conclusion

No other issues remaining, reconsideration and favorable action upon the claims 1, 3-4, 6-10, 13, 16-23, 25, 30-35 and 38-41 now pending in the application are requested.

Respectfully submitted,
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² For the record, Applicants also strongly disagree with the Examiner's apparent conclusion that the "reaction parameters" of embodiments of the present invention are a mere matter of optimization in the context of Tsukune et al. As discussed herein, Tsukune et al. is directed to the formation of an SiO₂ film, whereas the presently claimed invention is directed to the formation of a low dielectric carbon-containing film. One cannot arbitrarily alter process parameters as the Examiner suggests when the process is intended to achieve differing objectives.

Dielectric Constant Reference Guide

Dielectric Constant (k) is a number relating the ability of a material to carry alternating current to the ability of vacuum to carry alternating current. The capacitance created by the presence of the material is directly related to the Dielectric Constant of the material.

Knowing the Dielectric Constant (k) of a material is needed to properly design and apply instruments such as level controls using radar, RF admittance, or capacitance technologies. There are also analytical reasons to know the (k) of a material.

How to use this guide

CLIPPER CONTROLS has compiled an extensive list of products with Dielectric Constants. Many of these Dielectric Constants are given at specific temperatures. If your product's temperature is significantly different from those listed there is a good chance that the Dielectric Constant may be different from the values listed.

The products in this reference are listed in alphabetical order and are grouped in sections by the first letter of their name. Proper chemical names were used, and any trade names are the trademark of their respective owners. If you know the correct spelling of the name of the product you wish to review then use the "Search" feature on the web browser to locate the name in the list. You may also click on the letter from the alphabetical table to go directly to the beginning of that alphabetic section.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z #

-A-

ABS Resin, Lump 2.4-4.1

ABS Resin, Pellet 1.5-2.5

Acenaphthene (70° F) 3.0

Acetal (70° F) 3.6

Acetal Bromide 16.5

Acetal Doxime (68° F) 3.4

Acetaldehyde (41° F) 21.8

-S-

Safrol (70° F) 3.1
Salicylaldehyde (68° F) 13.9
Salt 3.0 - 15.0
Sand (Dry) 5.0
Sand (Silicon Dioxide) 3 - 5.0
Santowax (70° F) 2.3
Selenium 6.1-7.4
Selenium 11
Selenium (482° F) 5.4
Selevium (249° F) 5.4
Sesame 1.8-2.0
Shellac 2.0-3.8
Silica Aluminate 2
Silica Sand 2.5-3.5
Silicon 11.0 - 12.0
Silicon Dioxide 4.5
Silicon Tetrachloride (60° F) 2.4
Silicone Molding Compound (SMC)
(SMC) (Glass Fiber Filled) 3.7
Silicone Oil 2.2-2.9
Silicone Resin, Liquid 3.5-5.0
Silicone Rubber 3.2-9.8

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Term (Index)	Definition
silicon dioxide, SiO ₂	<p>silica; native oxide of silicon and at the same time an excellent insulator; the most common insulator in semiconductor device technology, particularly in silicon MOS/CMOS where it is used as a gate oxide; high quality films are obtained by thermal oxidation of silicon; thermal SiO₂ forms smooth, low-defect interface with Si; can be also readily deposited by CVD; SiO₂ performs various functions in silicon device technology which to large degree depends on outstanding characteristics of; also used in non-Si devices; Key parameters: energy gap Eg ~ 8eV, dielectric strength 5-15 x 10⁶ V/cm depending on thickness, dielectric constant k = 3.9, density 2.3 g/cm³, refractive index n</p>

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	=1.46, melting point ~ 1700 °C; prone to contamination with alkali ions and sensitive to high energy radiation; in semiconductor technology used in the form amorphous thin films; single crystal SiO ₂ is known as quartz.	Add to Google
silicon nitride, Si ₃ N ₄	dielectric material with energy gap = 5 eV and density ~3.0 g/cm ³ ; excellent mask (barrier) against oxidation of Si; commonly used in silicon integrated circuit manufacturing primarily in LOCOS process; not used as a gate dielectric due to inferior interface with silicon and bulk defects; properties depend on deposition method: dielectric strength ~10 ⁷ V/cm, dielectric constant k ~6-7, bulk resistivity 10 ¹⁵ -10 ¹⁷ ohm-cm; deposited by CVD.	Ferrotec Quartzware Fabricating Precision Quartz Solutions for Advanced Processes. www.Ferrotec.com
thermal oxidation, thermal oxide	growth of native oxide of the solid through oxidation of solid's surface at elevated temperature; results from chemical reaction of host atoms with oxygen containing ambient; thermal oxidation of silicon results in a very high quality silicon dioxide, SiO ₂ , formed on the silicon surface; most other semiconductors do	Semiconductor Consulting Wafer Processing, Implantation Metrology and Rapid Thermal Experts www.coresystems.com